ABSTRACT

This paper presents TAPONME, a therapeutic game built on iOS platform to assist early elementary children with Autism Spectrum Disorder in practicing social communication skills. The purpose of this work is to hypothesize that therapeutic game which has been designed according to autistic children’s limitations to engage them to play can be regarded as the third party in therapy sessions. Implementing effective psychological method in our game and using children’s interesting objects with simple rules and simple environment could engage our 14 participants (6 of them with low functioning Autism and 8 of them with moderate functioning Autism) to play TAPONME for ten sessions. Participant observation was conducted to find out their behavior and reaction in game engagement and get feedback on their limitations and learning goals, as a basis for further research on this topic.

Keywords: Computer Game, Autism Spectrum Disorder, Social Skills, disability.

I INTRODUCTION AND BACKGROUND

The Autism Spectrum: Autism is one of the groups of serious development problems known as autism spectrum disorders (ASDs) that cause substantial impairments in social interaction and communication resulting in unusual behavior and interests (Hassan et al., 2011). Based on parent reports, the prevalence of diagnosed ASD in 2011–2012 was estimated to be 2.00% for children aged 6–17. This prevalence estimate (1 in 50) is significantly higher than the estimate (1.16%, or 1 in 86) for children in that age group in 2007 (Blumberg & Bramlett, 2013). A local survey conducted a few years ago revealed that one in every 625 Malaysian children is autistic (Dolah, 2011). The significant increase in the prevalence of ASDs has led to an increase in research of related treatments (Rasche & Qian, 2012). Besides the causes of Autism are not clear and there is no cure for children who are affected by Autism. Researches show no two Autistic child are alike, Sometimes Autism is divided into low-, medium-, and high- functioning autism based on IQ thresholds, or on how much support the individual requires in daily life (Chen, 2012).

II GAMES FOR CHILDREN WITH AUTISM

Many persons believe that children with autism cannot learn. The truth is that such children can learn, but may do so only if great care is taken in designing and implementing their learning environment (Koegel, Schreibman, & Day, 2008).

Playing is undoubtedly a significant activity in everyone's life started from the time we were born. Considering the problem that Autistic children faced during their therapy sessions, psychologists take advantage of games. A 2011 national survey showed that 41% of U.S. children with autism are “heavy use gamers” – meaning that they spend most of their free time playing video games (Hiniker, 2013; Mazurek & Shattuck, 2012). Besides, when Autistic children are playing with technology devices they can play and practice in a safe and secure place while they are learning by their mistakes without getting harmed. Imagination is replaced by graphically advanced scenarios, actions can now be carried out that could not be performed in the real environment (Gamberini, Barresi, Majer, Scarpetta, & Piaget, 2005). In the past decade, a large variety of games has been proposed to support children in all three main areas of limitations that characterize Autism. For instance, (Cai et al., 2013) proposed a Virtual Dolphinarium for Children With Autism to promote learning and positive behavior among such children instead of emulating the swimming with dolphins. Go-Go-Games have been designed by (Hiniker, 2013) to teach a skill known as multiple cue responding modeled on Pivotal Response Treatment (PRT). Apart from this (Jain, Tamersoy, Zhang, & Aggarwal, 2012) presented a game for teaching facial expression to children with Autism. This game has been designed based on the parents report in an interview in which they preferred story lines with real-life scenarios.

III GAMES FOR CHILDREN WITH AUTISM FOR IMPROVING COMMUNICATION SKILLS

There has been a large amount of works for children with Autism in supporting the
development of communication skills through games especially on touch screen devices. (M. M. Rahman, Ferdous, & Ahmed, 2010) proposed a game and focused on increase fluency in the speech of the children with ASD. (Piper & O’Brien, 2006) presented SIDE (Shared Interfaces to Develop Effective Social Skills) on a diamond touch tablet a four player cooperative tablet. The study focused on Usability and skills development. (Davis, Otero, Dautenhahn, Nehaniv, & Powell, 2007) presented a TouchStory on tablet to promote understanding about narrative in children with autism, the research considered the children's apparent engagement with TouchStory. (Smith & Bernardini, 2013) presented ECHOES a serious game built 42” touch screen device to help young children with Autism practice and acquire social communication skills. Since the characteristics of children with autism limit their opportunity to take advantage of formal education (Cankaya & Kuzu, 2010), tools must be flexible in order to adapt to different users (López, José, Fórtiz, & García, 2009).

IV ABOUT TAP ON ME

A. Interface Of TAP ON ME For Children With Autism:

Within the Smartphones area the two most powerful operating systems at this time need to be highlighted: Android and iPhone IOS (Frutos, Bustos, Zapirain, & Zorrilla, 2011). Using touch screen devices is a solution for children’s repetitive tasks, children with Autism may enjoy repetition to the detriment of other activities (Davis et al., 2007). However, the observation of a child in his or her familiar environment (e.g. at home or at school) can support a clinic diagnosis by demonstrating the patient’s behavior in situations where natural communication and social interaction should occur (Michel, 2004). TAP ON ME has been designed on iOS platform for our 14 participants who are affected by Autism. The characters of the game, rules and environment are very simple, even children with nonverbal disability and with limited playing skills can use the application. The app is simple and easy to play with and the way to play it is by finding persons in a scene and tap on them at different locations. The point is that every three seconds the character responds a word that is match with the location and situation so that the player can easily memorize each greeting word such as “hello”, “goodbye”, “good night” or “good morning”. As the level progress, distracting objects emerge such as balls or animals, thus, teach the children to focus on their aim in order to be rewarded. The objects that will be added to the scenes are our participants' favorite objects. After two levels, we embed some animals with human’s faces (with eyes, eyebrow, nose.).

B. Therapeutic Approach for Tap On Me

Characteristics of children with autism limit their opportunity to take advantage of formal education (Cankaya & Kuzu, 2010). Apart from that, psychological methods cannot support all of the children’s limitations and it would be easier to engage a child to play game on computer or other
devices than attending a therapy session. Since one of our goals is to engage our participants to play our game, so it should be under consideration that children with Autism often have a strong attraction to some particular persons, objects, tasks, places or environments (M. R. Rahman et al., 2011). We took advantage of this issue and used their favorite objects as a reward to engage them to play. Children with Autism may be highly sensitive to noise (Davis et al., 2007) and we decided to use suitable sound in the game to not annoy them. The psychological method that we took under consideration is Applied Behavioral Analysis (ABA) that has proven to be very useful in some of the cases. ABA is most beneficial when it is used as an early intervention and as a rule of thumb, the earlier the better (Marian Tuedor, 2009). The severity and range of disordered thought processes, communication interactions and behaviors vary from one child to another, ranging from very low to very high functioning (Giusti, Zancanaro, Gal, & Weiss, 2011). ABA must focus on behavior; it doesn’t mean that after ABA therapy the Autistic child will stop complaining about behavior problems, but it helps to change the behavior. A behavior scientist cannot resort to the measurement of non-behavioral substitutes. ABA basically emphasize on repetition (the same thing repeat again and again until the child gets it correct at least 8 out of 10 trials). Based on our preliminary study and questionnaire from experts ABA method was the first recommendations for our 14 participants.

V METHODOLOGY
14 children who met the following criteria participated in our study: (a) were diagnosed with Autism spectrum disorder, (b) 4 to 7 years old, (c) very limited or no communication skills, (d) able to use computers and technology in basic level, (e) does not have physical retardation that obstruct the use of educational computer games. They were asked to play with TAP ON ME for ten sessions. Each session took around 10 to 20 minutes in a classroom in at the Hua Ming School for Autism in Selangor, Malaysia. For three sessions, participants' teachers were in the class to help the children. Requesting sessions conducted four days per week. We classified our participants into two groups, Group A and Group B, based on their limitations. This classification has been done based on our preliminary study and from questionnaires and interview with parents of participants and teachers. Participants in Group A often have verbal difficulty that they cannot communicate with others and there is less response from them when others want to communicate with them, while participants of Group B did not have such difficulty as they are on average level of limitation. Participants in group A consists of 8 students and group B had 6 students. To perform the experiment, one smartphone and one tablet (with 3.5“ and 10“ screen) were used. The researcher and child sat together and the child was given full control of the smartphone.

In each session the children were asked to play with the application from the first level to 3rd of 4th level and after they finished playing, their results were recorded, on the next session the children were asked to play the same game from the first level and they were expected to score better in the next sessions.

VI RESULT
In relation to behavior displayed by the children while actively being engaged in the interaction with TapOnMe, we focused on the number of times to try when the player has to find the character in simple or complex environments. This is to understand their behavior in game engagement, their needs and preference in learning. Figure 5 and 6 show results.
VII ANALYSIS

All the 14 participants, for the first minute of first three sessions, were not interested in the game; their teacher helped them to understand the rules of the game by playing together with each child for a few minutes. As majority of the participants were boys, and based on our initial study with questionnaires (Rias & Dehkordi, n.d.), we found out that they were interested in cars and vehicles, so we selected train as a reward to encourage and motivate them in playing the game. It seemed that Tap On Me was effective to teach participants to learn social communication skills. Participants of group A were rather slow in the beginning, but once they gained momentum, they were totally motivated in completing each level to see their rewards. The levels of the game become gradually difficult, but it helped these children to adapt themselves with the game. The strategies of participants of group B when they tabbed another place instead of character and error accrued tried to tab any object to collect the token and see the train or when they tabbed on the others objects and found that it was wrong they immediately found the character. The children seem very curious to explore the game. Participants of group A were interested to see the reward, some of them took the teacher’s finger and put it on the screen to help them or for the first session they tabbed anywhere of the screen randomly. However, while measuring performance, we noticed the children responded to the game slower than usual on the first session, but their performance improved as they played the game regularly.

VIII CONCLUSION

Children with Autism have to live with their limitations and problems and there is no cure in today’s medical advancement. However, some psychological methods can help them to improve their condition and assist in their quality of life. The computer game has been proven as a powerful device to help children with Autism. In our experiment, we found that the game (Tap On Me) helped the children to learn some social communication skills and match their ability with the game. Our participants in this experiment find it hard to concentrate for a short period of time, but when they are visually engaged, they are motivated and encouraged to excel. We have obtained some positive feedback from our study and we plan to continue expanding our work to help these children.

ACKNOWLEDGMENT

The authors would like to thank Universiti Teknologi MARA (UiTM), the Research Management Institute (RMI), and Research Cluster Fund (600-RMI/DANA 5/3 (7/2012)) for sponsoring a part of this research.

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